Vermont Bridge No. 48
Spanning the Winooski River on U.S. Route 2,
approximately .19 miles north of the
intersection of Vermont Route 100 south
(to Waitsfield) and U.S. Route 2
Waterbury
Washington County
Vermont

HAER No. VT-16

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
MID-ATLANTIC REGION, NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
PHILADELPHIA, PENNSYLVANIA 19106

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VERMONT BRIDGE 48 HAER No. VT-16

Location: Spanning the Winooski River on US Route 2 approximately 0.19 miles north of the intersection of Vermont Route 100 south (to Waitsfield) and US Route 2.
Town of Waterbury
Washington County
Vermont

USGS Middlesex Quadrangle, Universal Transverse Mercator Coordinates 18.679410.4910300

Date of Construction: 1924, Reconstructed in 1928 as built in 1924 following a major flood

Fabricator: Pittsburgh-Des Moines Steel Company (1924, 1928)

Engineer: Arthur D. Bishop - State Bridge Engineer (1924, 1928)

Present Owner: Town of Waterbury
Waterbury, Vermont

Present Use: Vehicular bridge

Significance: The bridge is significant as a representative example of bridges constructed in the early 20th Century. During this time, the use of trusses dominated the bridge industry, replacing the variety of designs characteristic of the 19th Century.

With its heavy, built up structural members and concrete slab floor, this bridge is typical of those built in the early 1920's, reflecting the demands of increased traffic. The bridge is eligible for the National Register of Historic Places.

Project Information: This documentation was undertaken in November and December, 1990, in accordance with a Memorandum of Agreement signed by the Federal Highway Administration, the Vermont State Historic Preservation Office, and the Advisory Council of Historic Preservation, (ACHP). The Memorandum of Agreement has been accepted by the ACHP as a mitigative measure prior to replacement of the bridge in 1991.

Prepared by Alison B. Church, Project Engineer, Location & Environmental Section, Vermont Agency of Transportation, Montpelier, Vermont.

1. Site Features and Historical Background

The bridge is located over the Winooski River in the town of Waterbury, Vermont. The Winooski River falls in the St. Lawrence River drainage area. The Winooski River is fed by many branches along its course from Cabot, Vermont, to down south, and then northwest to Lake Champlain. Lake Champlain drains north into St. Lawrence River which flows northeast until it drains into the Atlantic Ocean. (1)

The Town of Waterbury is located in the valley between the Green Mountain range on the west and the Hog Backs Mountain on the east. It is bounded in the south by the Winooski River. The Town of Waterbury is important for the perspective it offers on the impact of mid-nineteenth century transportation on the settlement pattern of a Vermont town. (2)

The Town of Waterbury was chartered in 1763. The first settlement in Waterbury occurred in 1770 in the northern section of the town. The first town meeting was held in 1790. The town was first represented in the General Assembly in 1792. In 1805, the Legislature granted a charter to a turnpike company to build a road between Montpelier and Burlington through Waterbury. This original road, considered a major highway at the time, was ravaged by a flood in 1830. It was rebuilt shortly thereafter on the same location. This crossing has historical importance in that the bridge is part of what was (until construction of the interstate in 1960) the principal highway. The Town of Waterbury essentially evolved on both sides of the old state highway. The bridge crossing marks the southern terminus of Waterbury's residential and commercial district. (3)

The early settlers of Waterbury were mostly involved in farming. Within a short period of time, woodworking industries came into prominence such that the woodworking and farming industries were equal in significance. The presence of rivers and tributaries resulted in numerous water-powered industries. Thatcher Brook, a major tributary of the Winooski River within Waterbury featured five sets of water falls at which the first grist mills were established. The first grist mill was built in 1792. Two tanneries, two saw mills, a wool cording mill, a potato whiskey distillery, a potato starch factory and a clapboard mill followed. Industries involving woodworking included wheelwright shops that made sleighs, carriages and wagons and shops making furniture, chairs, doors, windows, blinds, maple shoe last blocks, wood turnings, spools, scythe snaths, and baseball bats. (4)

Industries other than those involving woodworking include charcoal, ink, boots and shoes, harnesses, stoves, a wrapper and night shirt factory, brick, and a small copper mine. The significant agricultural industry yielded the usual dairy products of milk, cream, butter, cheese, condensed milk, and cottage cheese. (5)

While the Town of Waterbury was served to a large extent by its own manufacturing power, as well as its surrounding farms, growing transportation routes made commerce with Atlantic coast cities and towns possible. The opening of the Champlain Canal connecting the Hudson River (in New York) to Lake Champlain (between New York and Vermont) caused an increase of commerce in Waterbury in that freight was moved up the Hudson River across the Champlain Canal and down Lake Champlain to a port in Burlington. The goods were then transported the short distance to Waterbury by roadway. However, this impact pales next to the impact caused by the opening of the railroad in 1849. The railroad developed the tourism industry in Waterbury. (6)

In 1927, there was a major flood in Vermont resulting from three days of heavy rain falling on already saturated ground. The whole state was affected by the flood. In Waterbury, nineteen large bridges were swept away and eleven bridges were damaged. Bridge 48 was one of the bridges damaged. (7)

2. Bridge Description

Bridge 48 is a 21 foot wide double span truss bridge with a 165 foot long Parker through truss at the northern end and a 75 foot long Warren pony truss with curved upper chord at the southern end. The northern approach to the bridge is on a 30 degree curve and the southern approach is on a 23 degree curve. The roadway width is 22 feet. (8)

The Parker through truss is composed of ten 16'-5" panels. Each panel is detailed as follows:

The top chords are 12" X 21" box girders with latticed underside. The bottom chords are made of paired angles joined by the plates about 5' apart. The diagonals consist of paired angles with the plates 3' apart. The verticals are made of latticed girders with latticed angles for end uprights. The portal brace is a two-panel triangular truss of latticed paired angles continuing down as deep knee braces. The top bracing is made of similar members. There are no struts. The sway bracing is formed of angles. All joints are riveted. (9)

The Warren pony truss is composed of five 14' panels. Each panel is detailed as follows:

The top chords are made of 8 X 16" box girders with latticed underside. The bottom chords are composed of paired angles with tie plates on top about 3' apart. The verticals are made of plate girders. The first diagonal is composed of paired angles with ends and center. The second and fourth diagonals are made of paired angles joined by lattice bars. All joints are riveted. (10)

The floor system is composed of I-section floor beams and stringers with latticed bottom cross-bracing. In the pony truss, the cross bracing is made of paired angles. The bridge has a concrete slab floor. There is a sidewalk on the western side of the bridge, with railings made of angles and latticed bars. (11)

Since its construction in 1924, the main span of the bridge was reconstructed in 1928. In 1988, temporary repairs, in the form of welding structural support angles to the bottom chord of one of the trusses were made. The bridge is posted with weight limits for truck traffic since April 1989 due to its structural inadequacies. The structure is rusted all over. The deck pavement is cracked and broken in places. The abutments suffer from heavy spalling and scaling. The floor beams and stringers suffer from section losses. (12)

In the summer of 1990, some emergency repairs were done on the bridge. The trusses were reinforced by adding wide-flanged sections to the trusses at the deck level. On either side of the deck, these sections act as new bottom chords on either side of the deck carrying the load and they are bolted to the floor beams through connecting rods looping around the floor beams. The placing of the new reinforcing beams narrowed the already narrow roadway width of the bridge. Currently the bridge is open to only one-way traffic with traffic lights on either end of the bridge to control the traffic. (13)

3. Construction

The original bridge, a two span, 204 foot iron bridge, was designed by State Engineer Arthur D. Bishop and constructed in 1924 by the Pittsburgh-Des Moines Steel Company. Bridge 48 was one of the few bridges this company sold in Vermont prior to the 1927 flood. (14)

The truss of the main span (163 ft. long) of the bridge collapsed in the high floodwater. Ninety percent of the steel from the truss was salvaged and used in the 1928 reconstruction. The reconstructed bridge does not differ at all from the bridge originally constructed. The floor system of the long span was replaced and the abutments strengthened to hold the truss back in place. The state assumed the responsibility of replacing all the roads and bridges washed away by the 1927 flood. (15)

Prior to the reconstruction of the bridge in 1928, numerous efforts were made to re-establish a crossing of the river for this very important travel route. Two days after the main span of the bridge was swept away, steel cables forming a suspension foot bridge were strung across the river. This suspension bridge lasted only five days, the victim of high winds. Ferries carrying milk, grain, passengers, and automobiles crossed the river continuously. A temporary pile driven bridge was erected later that November only to be demolished on December 1st by a second flood. A second temporary pile driven bridge and cabled foot bridge were erected and used until the reconstruction of the truss in 1928. (16)

4. Design and Technology

Bridge 48 is typical of the 20th century engineering. The changes in the bridge fabricating industry in the late 19th Century had begun to narrow the variety in types of trusses used before that period. Some notable disasters had made the companies and their designers more conservative in the face of an enraged public. The well proven patterns like the Pratt, Warren and their variants gained an insurmountable edge. Warren and Pratt web systems with curved top chords were used as a standard practice for heavy loadings such as this two-lane state highway bridge. The heaviness of the structural members and the concrete slab floor reflect the demands of the greater and heavier motor traffic in the 1920's. (17)

Vermont Bridge 48 is unique in that its design is one of transition. The form of the trusses, the use of a smaller span over the floodplain, and the concrete slab floor are considered indicative of "post flood design". However, these features are better described as typical of the style of engineering at the time when Arthur D. Bishop was State Engineer (a position he held starting in 1919). Vermont Bridge 48, with the features detailed above as well as its use of built up members, represents a change in engineering method in response to traffic needs and design styles. (The Flood of 1927 necessitated another change in method, specifically the use of the lighter, rolled members rather than those built-up members of Vermont Bridge 48). (18)

The sway bracings on this bridge are found on few other bridges. This is one of the idiosyncrasies of its fabricator, Pittsburgh-Des Moines Steel Company. This company specialized in water towers with relatively minor work in bridge design. Its experience in water tower design translated well into bridge work as far as built-up girders and rolled I-sections which were used in both water towers and bridges. The Pittsburgh-Des Moines Company built very few Vermont bridges. (19)

ENDNOTES

1. Vermont Agency of Environmental Conservation Vermont Rivers Study, (Waterbury, VT: Vermont Agency of Environmental Conservation, 1986), pp. 124-139.

2. The National Survey, Gazetteer of Vermont Heritage, (Chester, VT: The National Survey, 1976), p. 49.

3. Theodore Graham Lewis, The History of Waterbury, Vermont, 1763-1915, (Waterbury, VT: Henry C. Whitehall, 1953), p.3.

4. Waterbury Historical Society, Waterbury, VT Commemorative Book 1763-1963, Souvenir Edition, (Waterbury, VT: Waterbury Historical Society, 1963) p.2.

5. Waterbury Historical Society, p. 2.

6. The National Survey, p. 49.

7. Swasey, Della LeBaron, "When Waterbury Was Under the Deluge", The Vermonter, 32 (Nov. 28, 1927): pp. 122-135.

8. United States Department of Transportation, "Waterbury-Duxbury-Moretown BRF 013-4(10) Final Section 4(f) Evaluation", Environmental Document prepared by the Vermont Division of the Federal Highway Administration, Montpelier, VT, July 1989. (Typewritten).

9. Vermont Division for Historic Preservation, "Historic Sites and Structures Survey", Bridge Survey Inventory Form prepared by the Vermont Division for Historic Preservation, Montpelier, VT, 1985 (Typewritten).

10. "Historic Sites and Structures Survey".

11. "Historic Sites and Structures Survey".

12. Vermont Agency of Transportation, "Bridge Inspection Report, Bridge #48 - Waterbury", Annual bridge inspection report prepared by Vermont Agency of Transportation Structures Division, Montpelier, VT, 1989. (Typewritten)

13. "Bridge Inspection Report".

14. Matthew Ross and Bruce Clouette, Vermont Historic Bridge Survey, (Montpelier, VT: Vermont Division for Historic Preservation, 1985), Appendix 6-11.

15. Vermont Historic Bridge Survey, pp. II-20-2.

16. Lloyd E. Squier, When the Water Came to Waterbury, (Waterbury, VT: The Record Print, 1928) p. 67.

17. Vermont Historic Bridge Survey, p. II-16.

18. Vermont Historic Bridge Survey, p. II-23.

19. Vermont Historic Bridge Survey, Appendix 6-11.

BIBLIOGRAPHY

Lewis, Theodore, Graham. The History of Waterbury, Vermont, 1763-1915. Waterbury, VT: Henry C. Whitehall. 1953.

The National Survey, Gazatteer of Vermont Heritage. Chester, Vermont: The National Survey. 1976.

Redmond, Myrtics Caldwell. "In Roads of the Flood on Old Waterbury Landmarks". The Vermonter 32 (Nov. 8, 1927): 116-121.

Ross, Matthew and Clouette, Bruce. Vermont Historic Bridge Survey. Montpelier, VT: Vermont Division for Historic Preservation. 1985.

Squier, Lloyd E. When the Water Came to Waterbury. Waterbury, VT: The Record Print. 1928.

Swasey, Della LeBaron. "When Waterbury Was Under the Deluge". The Vermonter 32 (Nov. 8, 1927): 122-135

Thomas, Dr. Peter A. Phase IA Archeological Reconnaissance Survey, Waterbury-Duxbury-Moretown BRF 013-4(10). Burlington, VT: University of Vermont. April 1989.

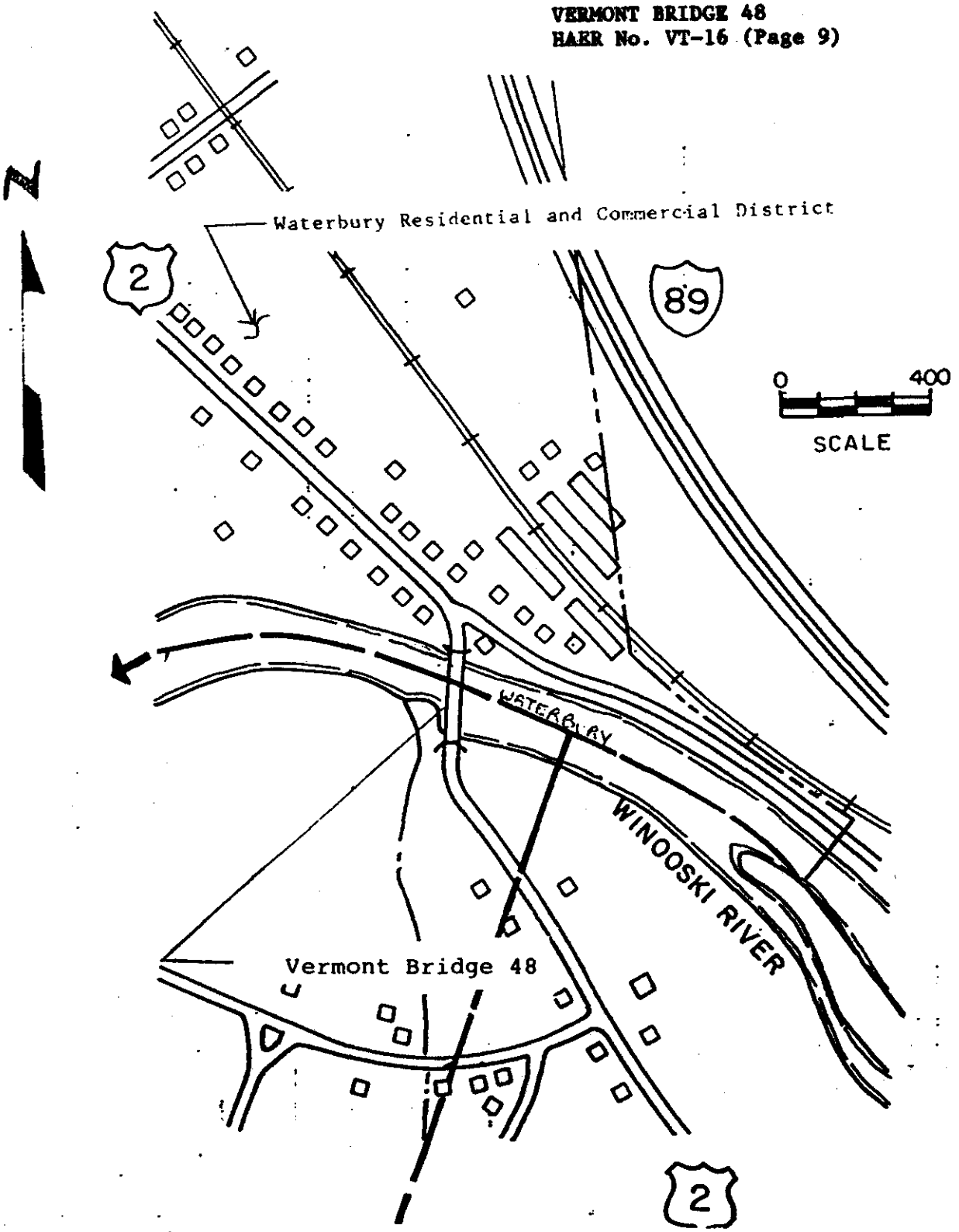
United States Department of Transportation. "Waterbury-Duxbury-Moretown BRF 013-4(10), Final Section 4(f) Evaluation". Environmental Document prepared by the Vermont Division of The Federal Highway Administration, Montpelier, VT. July 1989. (Typewritten).

Vermont Agency of Environmental Conservation. Vermont Rivers Study. Waterbury, VT: Vermont Agency of Environmental Conservation. 1986.

Vermont Agency of Transportation, "Bridge Inspection Report, Bridge #48 - Waterbury", Annual bridge inspection report prepared by Vermont Agency of Transportation Structures Division, Montpelier, VT, 1989. (Typewritten).

Vermont Division for Historic Preservation, "Historic Sites and Structures Survey", Bridge Survey Inventory Form prepared by the Vermont Division for Historic Preservation, Montpelier, VT, 1985. (Typewritten).

Waterbury Historical Society. Waterbury, VT Commemorative Book 1763-1963, Souvenir Edition. Waterbury, VT: Waterbury Historical Society. 1963.



SOURCE: Camels Hump Quadrangle, 15' Scale, United States Department of the Interior Geological Survey, Washington 25, D.C. 1951.